GSE
GRUPPO STAMBECCO EUROPA
EUROPEAN ALPINE IBEX SPECIALIST GROUP

23rd MEETING
OF THE

ALPINE IBEX
EUROPEAN SPECIALIST GROUP

GSE – AIESG

ABSTRACT BOOK

KALS AM GROSSGLOCKNER (A)

HOHE TAUERN NATIONAL PARK

29th - 31st OCTOBER 2015

23rd Meeting of the

Alpine ibex
European Specialist Group

GSE-AIESG

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Abstract book

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Oral presentations

Updating of European distribution of Alpine Ibex

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Different strategies of management of Alpine ibex in the European countries and a lack of a common policy of data sharing, has generated fragmented information about the status of the species. This project was cofinanced by Gran Paradiso National Park (as secretariat of the GSE-AIESG) and the Swiss Ministry for the Environment with the objective to increase the knowledge on the actual status of the species and the consistence of the existing populations.

The principal aims of the project were: a) to collect the most updated available data on ibex distribution and abundance, in order to create a new map of the current distribution of the species as well as to know the actual population size and status of the different colonies b) to create a new map of the potential distribution of the species on the Alps.

Despite for some colonies the data are not updated, most of the European colonies have been surveyed in the years 2012 - 2013 - 2014. The update confirmed that the species is present on the entire Alpine arc with almost 180 colonies and more than 50000 individuals counted in the years 2002-2014.

Despite the general situation of the species on the Alps seems favorable, at least from a numeric point of view, the recolonization time for Alpine ibex remains extremely long and, particularly for the areas where the colonies are far from each other, it seems unlikely to predict a spontaneous contact between colonies. The biggest issues about the conservation of the species seems to be the isolation of the populations together with the low recolonization rates and the extremely low genetic variability.

This work has also highlighted the need to share data on ibex census with constancy and to create a new tool for this purpose.

Studying movement ecology of female Alpine ibex: the Marmolada project

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This project has so far monitored (1 GPS fix/hour) 20 ibex females (2 or more years old) between 2010-2015 in the Marmolada population, North-Eastern Italian Alps. Accuracy of GPS locations was mostly influenced by skyview, and after filtering for outliers was good (median <10 m). Fix acquisition rate (FAR) from over 90,000 locations varied monthly (being close to 95% in summer but less than 85% in deep winter), and daily (being highest at dawn and dusk in summer, and during central day in winter). These patterns were explained by the climatic effects on animals activity and habitat choice. A clustering approach of locations features indicated that ibex experience a long "winter" and a short "summer". Weekly home ranges (n = 683) showed a strong annual pattern, with the minimum in January (3.4± 4.2 ha) and the maximum in July (49.9±34.6). The HR size was mostly influenced by climate (snow depth) in winter, and by variables indexing food availability (vegetation and NDVI) in summer, but their effect varied temporally and interacted with availability of refuge/shelter (slope). The movement ecology of female ibex is shaped by a strong seasonality and has peculiar patterns as respect to those of other large herbivores. In 2014, Fondazione Edmund Mach joined DAFNAE in the project, and we are seeking for cooperation with other research group to share locations data and improve knowledge on factors influencing the movement ecology and the adaptation to high mountain habitats of Alpine ibex, as well as of other similar taxa.

Movements, land uses, habitat selections and interaction with domestic fauna. Intakes of GPS technology for *Capra ibex* of the Ecrins national Park

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The collar's GPS technology inable to improve and characterize the real home range of *Capra ibex*. It make also possible to compare localizations with NDVI datas, land characterization to get information on land uses and habitat selections.

One goal of the studies is to get modelization of interaction with domestic fauna by comparison of alpine areas and home ranges, keeping in mind sanitary strategies and disease problems. The largest contribution of datas is the possibility of discrimining the strategie of each individual. It follows a typology of individualized behavior, social ties with regular patterns and totally atypical strategies. This increase the knowledge on colonization corridor and possibilities of this species.

Alpine ibex at low and medium altitude : facts and analysis versus prejudices and romanticization

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"Capra are essentially cliff dwellers with a wide tolerance for altitude...some living on treeless hills and other on wooded ones" Schaller (1972) is widely accepted, excepted in Alps.

Would C. ibex be an exception, the only one restricted to high altitude? An assumption:

- unnecessary;
- without any consistent hypothesis regarding causal relationships;
- inconsistent with a lot of facts, specially but not only, in Vercors since 1989.

It is worth considering causes of misinterpretation: first of all historical bias. On the contrary, relevant monitoring and interpretation of data had produced major learnings regarding eco-ethology of C. ibex and its reintroduction techniques. These learnings are widening its restoration prospects and requirements, as does also attentjon to the role of Capra for biodiversity, as instance for Gypaetus barbatus. (Hirzel et al. 2004).

Analysing annual horn growth of male alpine ibex in Hohe Tauern National Park and the Swiss National Park

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The annual horn-growth of alpine ibex (Capra ibex L.) is considered as a result as well as an indicator of biotic and abiotic environmental factors. We studied annual horn-growth of male alpine ibex from the Austrian Hohe Tauern National Park and the Swiss National Park. The two populations show different shapes of the yearly growth increments in all age classes, also in consideration of various time periods. Nevertheless the general trend development of the two age-dependent as well as the age-independent growth curves seem to perform similarly in the course of long-term population- and climatic dynamics. Further especially the horn annuli from the Hohe Tauern National Park to check the influence of specific local conditions as well as the role of already generally known influencing climatic parameters on the annual horn-growth of this ibex population, situated in the central eastern Alps have been analysed. Differences in annual horn-growth between various alpine regions in-between the Hohe Tauern National Park were found. Further the correlation between yearly horn-growth of alpine ibex in the Hohe Tauern, the amount of snow and the maximum temperatures in spring as inducers for the onset of an accessible and sustainable vegetation could be confirmed. In terms of life history theory, last it was tested weather fallen ibex and ibex which were physical affected show stronger horn growth during their first years of life than healthy hunted ibex. This hypothesis could be partly confirmed regarding fallen ibex. In addition affected animals grow shorter annuli in the year before dead.

Analysis of the diet of Alpine ibex using the DNA-barcoding technique

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Climate changes have proven consequences both on species population dynamics and on loss of biodiversity. Species living in Alpine and Arctic habitats could be even more exposed to climate change effects. It is thus important to investigate the dietary habits of species like the Alpine ibex (*Capra ibex*), with a life cycle strictly dependent on the seasonal variation of temperatures and phenology, typical of Alpine environments.

This study aimed to assess the selectivity of Alpine ibex during grazing, to highlight a possible difference in the diet between sexes, to search for seasonal differences in feeding behaviour and to identify possible key-species in the diet. During spring-summer 2013, we collected 120 faecal samples (60 males and 60 females) of adult ibex inhabiting the Levionaz basin (AO), in Gran Paradiso National Park. The genetic analysis were performed using the DNA-barcoding technique. This method allow an accurate and precise identification of taxa, on the other side, does not produce quantitative but semi-quantitative data. Results of DNA-barcoding analysis showed that Alpine ibex is not very selective on food choice. We also found a difference in the diet composition between males and females, mainly linked to the differences in their habitats, but probably also because of different physiological needs between sexes. Finally, we observed a seasonal difference in the diet composition, probably due to the movement of individuals towards higher grazing patches during summer.

To deal with the limits of DNA-barcoding results (semi-quantitative data) we recently developed a standardised method to collect quantitative data on ibex diet composition, through direct observation of the feeding behaviour.

The method would allow us to compare quantitative data from direct observation and semi-quantitative data from the DNA-barcoding analysys.

Careful management of old males after massive losses due to high winter precipitation and hunting. Migrations, distribution and development of an ibex-population in the northern part of Vorarlberg/Austria

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Around the mountains of Arlberg, in the north-eastern range of Vorarlberg, lives a population of nearly 500 Alpine Ibexes. The population has a high reproduction rate. The age distribution of the females has always been in a natural range with females achieving the age of 18 years. Though, until the year of 2001 only in very rare cases male animals reached the age of 9 years. We identified two major reasons: high snow falls at the northern fringe oft he Austrian Alps occur regularly, but in some particular years the very high snow layer is a reason for important losses of exausted breeders. These losses of males at the age of 9 and more years could be replaced in the following years and would sooner or later lead to a fair amount of breeding males at the age of 10 and more years. But until the year of 2001 there was a constant and high hunting pressure on the elderly males (9+). Mating was carried out by males of middle age (5 to 8 years). After the implementation of strict rules for the hunters the number of males at the age of more then 10 years has constantly risen. Sustainable use in this case means that only half of all males at the age of more than 11 years are to bee taken, the rest may die of natural causes. In order to understand the ecology and the reasons for a higher mortality of ibex males we studied

the size, composition and seasonal distribution ,the migration routes as well as the summer and winter home ranges by means of direct observation (Meile) and GPS-transmitters (Frey-Roos et al.). We found some interesting patterns of distribution and survival strategies.

The disappearance of ibex due to climatic reasons in the Eastern alps - new insights

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The last ibex colony in the Eastern Alps was probably situated in the »Zillertaler Alpen« (Austria). In 1694 179 animals were counted in this region, the ibex population disappeared at the beginning of the 18th century. Historical evidence suggests that the colony collapsed, as the Salzburg archbishop tried to establish a new population in the »Tennengebirge«, which is situated 20 km south of the City of Salzburg. Nearly half of the ibex in Zillertal were caught alive for this purpose during the following years. This drastic reduction of the initial population has probably led – together with the very cold and snowy winter of 1708/09 – to the extinction of the ibex in the Zillertal region. These ibexes are, according to evolutionary biologists, very likely to have been the last specimen of a today extinct Eastern Alpine subspecies.

Trade-offs between thermoregulation and access to resources in Alpine ibex: implications for understanding species' responses to climate change

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As the climate warms, thermally sensitive species may experience increasingly precarious trade-offs between investment in thermoregulation versus other key processes. Alpine ibex are cold-adapted, and reliant on behavioural mechanisms to cope with high temperatures, reducing their activity and moving to higher altitudes when it is hotter. Such movements could result in ibex using less profitable foraging areas at higher temperatures, as alpine meadows are replaced by sparser vegetation at higher altitudes. Here, we investigate the potential for a trade-off to exist between thermoregulation and resource acquisition by examining variation in the altitude use and activity budgets of 43 male ibex between May and October 2011 in Levionaz Valley, Gran Paradiso National Park. We used structural equation modelling to investigate the impacts of ibex altitude use on both the ambient temperature and resource productivity that they experience. Additionally, we considered that ibex may compensate for reductions in resource productivity by adjusting their time spent foraging. We found that, by moving to higher altitudes during spring and summer, ibex maintained their ambient temperature within a very narrow band. However, as predicted, they consequently utilised foraging areas with considerably lower resource productivity when it was hotter. Furthermore, there was no indication that ibex could compensate for reductions in productivity by adjusting their activity budgets. As such, we identify a trade-off between thermoregulation and access to resources, which could have far-reaching consequences for ibex foraging success under climate change.

Patterns of spatio-temporal change in Alpine ibex (*Capra ibex ibex*, L.) distribution in Gran Paradiso National Park

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Ibex is the symbolic species of mountain ungulates and currently it is classified at Least Concern by IUCN. In the last few decades there was a drastic decrease in population abundance linked with a reduction of stable occupied territories. Causes are still not completely clear but drastic decline is in partly due to recent climate changes.

The objectives of this study are to analyse the ibex distribution changes in Gran Paradiso National Park (GPNP) in 1985-2014 period, the type of relation between pattern of distribution and population trend and finally the evidence of most used ibex 's territories in GPNP.

To understand distribution patterns ibex census data are been analysed using metrics belonging to landscape ecology, an approach based on the notion that environmental patterns influence ecological processes. In particular 5 metrics are been used to assess the composition and spatial configuration of occupied areas, while distribution statistics provided a statistical summaries of obtained results.

Results showed a reduction of ibex occupied territories from 4587.50 ha in 1985 to 2437.50 ha in 2014 and fragmentation of ibex occupied territories with a strong increase in number of occupied patches from 130 units to 229 units.

We suggest that likely ibex distribution was influenced by different combined factors (landscape change, climate change, anthropic activities), which have to be still examined in depth. Landscape ecology approach may become an useful tool to understand the degree of fragmentation and connectivity of landscape defined on species distribution.

The understanding of processes behind Alpine ungulates distribution have to consider the influence of landscape patterns on environmental processes to improve the conservation efforts at management level.

Problems of small populations in case of 'Großer and Kleiner Rettenstein'

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Between 1975 and 1979 seventeen ibex have been released in the area of the "Großer and Kleiner Rettenstein" in the Kitzbüheler alps. The habitat in this area is just the size of about 600 hectares. At the beginning the population developed well and about 50 ibex could be counted in 1985. From the year 1982 on single animals have been shot. Eight years later a "foster-association", including 11 hunting grounds, was founded. Counting about 75 ibex in 1996 the population was affected by footrot and only 43 ibex survived (from 32 males only 7 males survived). Afterwards the population developed well again, additional 7 ibex have been released in 2002, but these animals died in the following winter. In 2014, in spite of hunting, 114 ibex could be counted. Indeed in the same year a few ibex have been found dead as a consequence of sarcoptic mange. In the following winter and spring the number of ibex found dead due to mange increased and in July 2015 no ibex could be counted in the area of these 11 hunting grounds anymore. Considering this development it is called into question, if releases of ibex in such small habitats are meaningful and if the requirements of ibex can be satisfied at all in areas like this.

Genomic signatures of inbreeding and introgression in reintroduced Alpine ibex

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The history of repeated bottlenecks has left a genetic footprint in Alpine ibex populations. Genetic diversity is low and individuals within populations show a high degree of relatedness. We use whole genome sequencing to investigate genomic signatures of these bottlenecks along the Alpine ibex genome and compared it with the domestic goat. We found a very high frequency of long runs of homozygosity along the genome of Alpine ibex again indicating high levels of inbreeding. The biggest impact of inbreeding on individual fitness is expected in the presence of deleterious mutations. Our genomic analysis indeed suggests that Alpine ibex have accumulated more deleterious mutations than domestic goat. We furthermore describe genomic signatures of the previously reported evidence of introgression from domestic goat at a locus important for immunity. Without the introgression, Alpine ibex would have no genetic diversity in a region where such diversity is especially important.

Footprint: a collaborative Visual Arts/Science project between Edward Monovich and the University of Zürich Institute of Evolutionary Biology

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Research performed by The University of Zürich's Institute of Evolutionary Biology tells a compelling story of the Alpine Ibex's contemporary health and rescue from extinction. Genetic research quantifies the lasting legacy of reintroduction efforts that began over one hundred years ago in Switzerland. The "Footprint" exhibition communicates the intricacies of this cutting-edge research via interactive installations that include video, photography, painting, and sculpture. The primary goal of the exhibition is to facilitate interdisciplinary exchange of scientific, historical, and cultural ideas. A project website will archive responses from American and Swiss exhibitions and create a mechanism for transatlantic dialogue.

Ibex symbolize sure-footedness and the pursuit of higher ideals. These characteristics are mirrored in the impressive efforts of a nation to restore a beloved species to prominence. Reestablishment of Alpine Ibex populations comprises an unparalleled success story, where human efforts have created tangible, positive ecological results. The story of the Alpine Ibex can provide a catalyst for positive human intervention in the natural world.

“Teufelsböcke” - Osteolysis of the processus cornualis in Alpine ibex

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The term „Teufelsböcke“ („devil bucks“) originates from the resemblance of the affected animals’ bizarrely deformed horns to the woodcarved masks, worn during a traditional Alpine custom named “Perchtenlauf”.

This rare malformation observed on adult male Alpine ibex is caused by a lysis of the processus cornualis of the frontal bone. The solid bone structure inside the afflicted horn is replaced by a coarse-grained mass of yellow-white material, thus resulting in the loss of the supportive function followed by unphysiological deformation, causing the horn to bend towards the ground. In initial stages of the lysis a watchful spectator might detect small lesions at an annual ring with darker coloration in the surroundings

Although samples were sent to several laboratories it was not yet possible to ascertain the origin of this problem.

Paratubercolosis in ibex

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Paratuberculosis is a widely spread, infectious, chronic intestinal disease, especially in ruminants, which is caused by *Mycobacterium avium* subsp. *paratuberculosis* (*Map*). The increase in clinical cases of paratuberculosis in eleven wild animal species in Styria/Austria since 2002 is assumed to have been caused by the purchase of cattle and farmed deer, a strong increase in suckler cow farming with a concentration of pathogens in the environment and a lack of feed hygiene in wildlife feeding.

Major symptoms of paratuberculosis in game animals were extreme weight loss, weakness and delayed change of coat and significantly enlarged mesenteric lymph nodes. Evidence of diarrhoea was observed in about 15% of positive cases. Our study for the first time provided evidence of intrauterine transmission of *Map* in red deer and chamois and the isolation of the pathogen from the liver, lung and other subcutaneous granulomas of wild animals. In wild animals disease occurs in considerably younger animals than in cattle.

Samples were taken from mesenteric lymph nodes and in case of pathologic lesions also from affected organs.

In Austria paratuberculosis was declared a notifiable disease for cattle, sheep, goats and farmed game in 2006.

Possible causes of the increase in clinical cases, the clinical picture of paratuberculosis in wild animals, diagnostic possibilities as well as control and prevention measures and, not least, meat hygiene considerations are discussed.

Brucellosis in a free-ranging French Alpine ibex population: a collective expertise aims to improve management decision to control health risks

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Following two autochthonous human cases due to *Brucella melitensis* biovar 3 in an official-free country in 2012-2013, the hypothesis of a reservoir in wildlife has been investigated in the neighbouring of an infected cattle. A high prevalence was found in a very localised population of Alpine ibex. Aiming to reduce the risks for domestic herds and human health, massive culling was initially applied to this population. Considering the unexpected results (increase in prevalence rate in some groups), and ethical statements (fully protected species), an expertise was then carried out to analyze the data available and to evaluate different management strategies for controlling/eradicating the disease in this wild population.

Therefore, Anses launched a call for experts in October 2014 to build an international and interdisciplinary group of 14 members. This working group had to take into account epidemiological data as well as population dynamic and social pattern studies, in order to evaluate 19 management options, including biosecurity measures, vaccination, test-and-cull, slaughtering and surveillance,. The experts employed first a qualitative assessment to evaluate the global evolution of the sanitarian situation for wild and domestic animals. Then, a stochastic individual-based model was developed for the wild population of ibex in the concerned area to predict the outcome of management scenarios for the period 2015-2020.

Finally none of the management options proves an uncontroversial effectiveness, especially "one-year" options. Some scenarios combining several measures appear to improve significantly the chance of positive sanitary outcome; anyway in all cases, the management will require a long-term and upgradeable program according to the results of the wildlife surveillance, necessary implemented both in the concerned area and neighbouring massifs.

Aknowledgments to : Paule CARNAT-GAUTHIER[1], Jean HARS[2], Jean-Claude ROUBY[1], Amélie VANISCOTTE[2], *1 : Agence Nationale du Médicament Vétérinaire, Anses-ANMV, Fougères, France; 2: Office National de la Chasse et de la Faune Sauvage (ONCFS), Gières, France*

Fitness cost of reproduction according to environmental conditions in female ibex (*Capra ibex*): The case of the 2007-2008 pneumonia outbreak in Vanoise

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The fitness costs of reproduction can be masked by individual differences, and may only become apparent during adverse environmental conditions. How fitness costs are influenced by the interplay between the environmental context and overall individual differences requires further investigation. Here, we evaluated fitness costs of reproduction based on 15 years of monitoring of individual Alpine ibex (Capra ibex) during a period when the population was affected by a severe disease outbreak (pneumonia) with high mortality for females over 8 years. We quantified fitness costs using a novel multi-event capture-mark-recapture (CMR) modeling approach that accounted for uncertainty in reproductive status to estimate the survival and reproductive success of female ibex while also accounting for overall individual heterogeneity. Our results show that the ability of females to reproduce was highly heterogeneous: one group including 76% of females had a much higher probability of giving birth annually (between 0.66 and 0.77 depending on the previous reproductive status) than females of the second group (24% of females, between 0 and 0.05 probability of giving birth annually). Low reproductive costs in terms of future reproduction occurred and were independent of the pneumonia outbreak. There was no survival cost of reproduction either before or after the epizootic, but the cost was high during the epizootic. Our findings indicate that adverse environmental conditions may lead to survival costs of reproduction in long-lived species and select against females that have a high reproductive effort. Thereby, the occurrence of adverse conditions increases the diversity of reproductive tactics within a population.

Important losses due due to Contagious Foot Rot: a case in the north-eastern part of Switzerland

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Around the mountain Säntis in the north-eastern part of Switzerland lives an Alpine Ibex colony of about 180 animals. In the same area, but on the best pastures live several herds of about 1000 sheep and 100 goats. Since 1991 there have been several outbreaks of Contagious Foot Rot in the years as follows: 1991, 1992, 1996, 1998, 1999, 2010, 2011 and 2012. There have been fatal consequences and an important loss of male ibexes in the age of 6 and more years. The number of males at the age of 11 and more has dropped to zero since 2013. We discuss the reasons why females and younger animals are not so much affected as well as the consequences and possible measures for sheep farming in the habitat of chamois and ibex.

Assessing the impact of chemical immobilisation on Alpine ibex in the Gran Paradiso National Park

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A wide array of research, conservation and management programmes requires the capture of wild animals. While the reasons to perform captures are clear, researchers have only recently paid attention to assess the risks and negative effects of this activity, particularly in terms of delayed and latent effects. Here we investigated the influence of chemical immobilization on Alpine ibex (Capra ibex) in the Gran Paradiso National Park, where is adopted one of the less invasive methodology used to capture ungulate species. For ten days after the capture we collected data on spatial behaviour, activity levels of both males and females, and male hormone levels. Moreover, for each marked female captured since 2000 we recorded its reproductive status. We performed statistical analyses to investigate the effects of the capture taking into account biological factors and environmental conditions. Our results showed that this capture methodology did not affect either spatial behaviour (for both sexes) or male hormone levels. Instead, up to two days after the capture both sexes showed reduced activity levels. The capture did not significantly affect female productivity. Our findings highlighted the scarce impact of chemical immobilisation on ibex biology, showing that our methodology is one of the less invasive procedures to capture large mammals. Nonetheless, in areas characterised by high predator density, we suggest that animals released be carefully monitored for some hours after the capture. Moreover, we recommend that researchers exclude from their analyses data collected in the first days following capture so as to avoid biased results.

Poster session

The Alpine ibex in South Tyrol

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The Office for Hunting and Fishing in Bolzano (Amt für Jagd und Fischerei / Ufficio Caccia e Pesca) is looking forward to participate in the meeting of the Alpine Ibex European Specialist Group by providing a poster containing information about distribution and population dynamics of Alpine ibexes in South Tyrol based on census results from 1988 to 2015. Furthermore, it explains future projects on the release and reintroduction of ibexes from the biggest existing metapopulation to other suitable areas which are not yet populated by ibexes, as well as the hunting activities concerning the species in the area, both of which are aimed at creating healthy, viable ibex populations in the South Tyrolean part of the Alps.

As a last point, there is information about the most common diseases affecting the animals, because they are one of the main problems that cause the ibex population to decrease (or at least slow down accretion) and have even extinct certain colonies in the province.

The information on the poster is provided by the Office for Hunting and Fishing in Bolzano, the authors of the poster are Andreas Agreiter, Lena Schober and Martin Stadler, all current members of the above-named office, as well as Giorgio Carmignola, former member of the office.

Lo Stambecco delle Alpi nel Parco dell'Adamello

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In the summer 2013 the Association Uomo e Territorio Pro Natura started the Project called Stambecco Adamello (Ibex Adamello).
The Project aims to estimate, monitor and protect the Alpine Ibex population in the area of Adamello Park. The Ibex population of the this area is the result of a reintroduction Project, started by the Park in the mid-nineties.
From autumn 2013, every year the Association coordinates two session (autumnal and vernal) of census activities in all suitable Park areas for the species,thanks to the extraordinary collaboration of over 50 volunteers that are specifically trained and updated.

Monitoring of an Infective Keratoconjuntivitis outbreak in Alpine ibex populations within the Stelvio National Park and the Swiss National Park

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In mid July 2015, in the Saliente Valley – on the border between the Stelvio National Park and the Swiss National Park – a male ibex was reported to show signs of eye disease. During a preliminary survey conducted in the same area by the Parks' personnel, with the assistance of a veterinarian, an adult male showing clinical signs attributable to Infective Keratoconjunctivitis (IKC) was darted. Conjunctival swabs were taken to identify the outbreak's aetiology, and the subsequent PCR analysis confirmed the occurrence Mycoplasma conjunctivae. In early August, the two Parks started a systematic monitoring programme with the aim to investigate the geographical and temporal evolution of the IKC outbreak. Park wardens were asked to survey the ibex populations at given time intervals and collect information about location, sex, age, presence and characteristics of IKC signs in both eyes for each observed individual. The severity of IKC signs was classified following previous studies conducted in the Swiss Alps, i.e. using multiple-choice answers (no clinical signs - 0, ocular discharge - 1, corneal opacity - 2, neovascularization or perforation - 3). In August of 2015, the IKC geographic distribution appeared limited to the north-westernmost ibex population of the Stelvio National Park, and to the south-westernmost ibex population of the Swiss National Park. In outbreak areas, about 43% (Stelvio National Park) and 50% (Swiss National Park) of the ibex showed signs of IKC, whose severity was on average 1.1 ± SD 0.7. Forthcoming data shall permit a detailed evaluation of the ICK outbreak evolution.

Alpine ibex winter census in Varaita Valley (Cuneo, Piedmont, Italy)

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The latest records of ibex presence in Varaita valley date back to the second half of XVIII century.

In 1999 the Cuneo Province reintroduced the species in the Cozie Alps. During this project 13 animals were release in Varaita valley: 10 in 1999 and 3 in 2003. Other 11 animals coming from Swiss Alps were released in 2006 (project "100 years of ibex in Switzerland / Steinbock 2006").

Since 2002 the "Comprensorio Alpino CN2" organizes annual counts of this species in early summer.

Since December 2009 the census is carried out during the ibex breeding season. During this season the monitoring effort can be focused on the wintering areas with more accurate and reliable results.

The monitored areas lay in the territorial jurisdiction the "Comprensorio Alpino CN2" (municipalities of Bellino and Pontechianale -Cuneo province, Piedmont, Italy).

The census is carried out in five wintering areas with an extension of about 830 ha.

During last census (December 2014) 216 ibex were observed (sex-ratio 1:1.3, KK/100FF 48.9) with a mean density of 29.8 animals/100 ha. The population trend has increased in the last 7 years. This increase is statistically significant (S-Spearmann= 6, p= 0.05, rho= 0.82).

Alpine ibex *Capra ibex* survey and Maximum Entropy Modeling application in Western Cotian Alps (Piedmont, Italy)

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Reintroductions carried out between 1987 and 1988 in the Val Troncea Regional Park, nowadays part of the "Ente di gestione delle aree protette delle Alpi Cozie", have allowed the return of the Alpine Ibex in the upper Chisone Valley and the following expansion of this population in the adjacent Germanasca and Argentera Valleys.

In order to monitor the distribution and the abundance of this species in this Protected Area and in the neighbouring mountains, the Val Troncea Regional Park staff carried out standardized counts during summer (since 1996) and winter (since 2006) seasons. This surveys allowed to detect the population size (MNA minimum number alive) and structure, estimate the related demographic parameters and the geographical expansion of the original colony.

We submit here the results of the first ever use of MaxEnt (Maximum Entropy Modeling), a program for modelling species distributions from presence-only species records, to predict the potential distribution in the west Cotian Alps (Germanasca, Susa and Chisone Valley; NO 313664 - 5010625, SE 364622 – 4966910, UTM 32 N, WGS 84).

Finally the goal of this work is to use the presence data derived from the surveys and a series of geomorphological parameters and land cover to verify if the Rete Natura 2000 of the Piedmont Region meets the requirements of the alpine ibex ecological niche in our study area (19 Site of Community Importance and 1 Provincial Park).

An update on sarcoptic mange in alpine ibex colonies in the Eastern Alps, Italy: status and perspectives

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The sarcoptic mange epizootic affecting wild Caprinae in the Eastern Alps, Italy, raises concerns for conservation of the existing alpine ibex colonies. Actually, scabies may cause an ibex colony to drop under the minimum viable population (as occurred for Sella and Pale di San Martino colonies), and even lead it to extinction (as occurred for the Croda del Becco colony). A remarkable amount of data concerning ibex demography and passive mange surveillance is being collected by different Institutions, in order to analyze mange patterns in ibex populations, deepen the knowledge of the Sarcoptes scabiei-alpine ibex relationships and detect the most important factors driving the impact of the disease in this species. Notwithstanding, the interpretation of these data in a conservation and management perspective is still very difficult, and most of the main questions remain still open. Among these:

1. Which are the dynamics of cross-transmission and maintenance of S. scabiei between alpine ibex and the abundant sympatric Northern chamois?; 2. Why the majority of the affected ibex colonies suffers a severe impact by sarcoptic mange, whereas in a few others (as the Croda Marcora-Marmarole colony and the Monte Canin colony), even in proximity to each other, the disease appears to exert a definitely lower impact?; 3. Considering that the decrease of a colony under the minimum viable population often forces wildlife managers towards restocking/reintroduction, is it conceivable that using ibexes from the "resistant" colonies would introduce tracts of resistance to sarcoptic mange?

The aim of the present work is to update the demographic status of the ibex colonies affected by sarcoptic mange in the Eastern Alps, Italy, with the ultimate goal to focus research priorities for the management of S. scabiei in the alpine ibex.

Preliminary analysis of temperament in Alpine ibex (*Capra ibex*): individual differences in flight distance

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In behavioural ecology, temperament or personality defines the idea that individual behavioural differences are consistent over time and/or across situations.

Boldness is a trait of temperament related to individual responses in new or potentially dangerous situations. In this work we used flight behaviour as proxy of boldness in male Alpine ibex (*Capra ibex*). The study was carried out on a population of marked individuals in an area of Gran Paradiso National Park to investigate if boldness is a personality trait measurable in this species.

Particularly, our study analyze if there are consistent indivdual differences in flight behaviour and which factors influence it. Boldness has been measured through a test on flight distance during which an operator walked toward the target individual and measured alert distance (AD) and flight initiation distance (FID). AD was defined as the distance between the operator and the target individual when the animal stopped the previous activity and alert, FID was the distance between the operator and the target individual when flight started. During FID test all other factors that might influence flight distance were kept constant (speed, direction of approach and of gaze of the operator). FID test was repeated on the same individuals to measure repeatability of the behavioural response (N=50 test on 15 individuals; mean= 3,33, sd= 1.05).

Older individuals showed shorter FID. Individual repeatability of FID was 26.8%, indicating that individuals showed constant differences in the beaviour analyzed. This study established a first evidence of the presence of measurable personality trait in Alpine ibex.

ORGANIZED BY

Hohe Tauern Nationalpark [Austria]
Parco Nazionale Gran Paradiso [Italia]

SUPPORTED BY

Tiroler Jägerverband

UNDER THE ENDORSEMENT OF

Alpine Network of Protected Areas - ALPARC
IUCN Caprinae Specialist Group

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